The similarity basis for consonant-tone interaction in Agreement by Correspondence

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- Agreement by Correspondence (ABC; Hansson 2001; Rose and Walker 2004)
  - Optimality-theoretic framework originally developed for long distance consonant agreement.
  - Basic insight: segments that are similar strive to become even more similar in harmony.

(1) Kera (Chadic): voiced plosives trigger voicing agreement in other velar plosives. (Rose and Walker 2004)

a.	/kV-gə̀r/	→	[gə̀gə̀r]		'knee'
b.	/kV-màanə̀/	→	[kəmàanə̀]	*[gəmàanə̀]	'woman'

❖ Does ABC supplement or supplant autosegmental feature-spreading?

- Claimed differences (from Hansson 2001; Rose and Walker 2004; Gallagher 2008; Gallagher and Coon 2009; a.o.):

ABC	Feature spreading
– consonant harmony	– vowel harmony
– long distance interactions	– local assimilation
– absence of blocking (transparent intervening segments)	– blocking effects
– similarity basis in harmony	– no similarity precondition

- But, the ABC framework…
  - accounts for vowel harmony patterns (Sasa 2009; Walker 2009; Rhodes 2010; a.o.)
  - does not restrict locality of correspondence (usually an external stipulation)
  - handles blocking via high-ranking markedness constraints (Hansson 2007; Rhodes 2010)

❖ The key conceptual difference remaining between ABC and feature-spreading
= the role of similarity as the basis of harmony patterns.

<u>The proposal</u>

❖ ABC's ability to make direct reference to similarity in determining segmental agreement offers important insight in dealing with consonant-tone interaction, which has remained a perennial problem for autosegmental feature-spreading, despite being a local effect.

❖ Claim: Whether a consonant affects tone is an emergent effect of sonority, which underlies the relationship between segments and tone: the more similar in sonority two segments are, the more they will interact in tone specification.

❖ Evidence from interaction between *onset* consonants and tone in Dioula d'Odienné (Mande, Côte d'Ivoire; Braconnier 1982, 1983; Braconnier and Diaby 1982).

❖ ABC can also handle depressor/elevator consonant-tone effects through segmental opacity (following Hanson 2007; Rhodes 2010).

1 THE SONORITY-TONE RELATIONSHIP

(2) Sonority scale (simplified; Jespersen 1904; Clements 1990; more recently and for phonetic basis: Parker 2002; Miller 2012; cf. Sylak-Glassman 2012; a.o.)

vowels	↑	Most Sonorous
glides		
liquids		
nasals		
voiced obstruents		
voiceless obstruents	↓	Least Sonorous

- Sonority interacts with syllable structure, stress, weight (Blevins 1995; de Lacy 2004; Crowhurst and Michael 2005; Zec 2007; a.o.)

❖ Claim: Reference to sonority is essential in defining the class of segments that can interact for purposes of tone. → More sonorous segments transmit pitch signal better than less sonorous segments. Obstruents perturb F0 more than sonorants do.

❖ But, does sonority really interact with tone?

(3) Contour tone licensing
  a. In Chinese languages (e.g., Cantonese), obstruent-final syllables cannot license contour tones and are restricted to level tones. Only sonorant-final syllables (vowels, nasals) may license contours (Yip 1995: 488).
  b. In Hausa (Chadic), all closed syllables (CVX) license contour tones, with no sonority distinction (Yip 2002: 27).

Answer 1: No. Sonority and tone only have an indirect relationship mediated through prosodic structure (i.e., moras) (de Lacy 2007: 299). → When coda consonants license contour tones, they are moras.

Answer 2: Yes.
- Hausa pattern is rare (3/105 languages in Gordon's (2001) contour tone survey). More commonly, sonorous segments will license contour tones.
- Sonority of *onset* segments and tone: e.g., Kurtöp (Tibeto-Burman) had recent tonogenesis, following a distinction between voiced and voiceless sonorants, as opposed to obstruents (Hyslop 2009).

❖ Dioula: sonority of *onset* segments interacts directly with tone: i.e., it's <u>not</u> about moras.

2 THE CASE OF DIOULA D'ODIENNÉ

- Two lexical classes for noun roots in Dioula:

  High-toned: lexically specified H on penultimate syllable (optional H on final syllable)
  e.g., /fólón/ → [fólón] 'sheath, indef.'

  Low-toned: no lexically-specified H on penultimate syllable; surface as low in isolation
  e.g., /folon/ → [fòlòn] 'ditch, indef.'

- An independent difference cross-cutting the high/low root classes: Dioula nouns exhibit two types of tonal behavior when preceding a H tone marking definiteness or a H tone of an immediately adjacent word.

Before H…

Type 1: Tone changes on the final syllable only.

Type 2: Tone changes on the penultimate and final syllables.

(4) Low-toned roots

		indef.	before H (def.)	
a.	**TYPE 1**	sɛ̀bɛ̀	sɛ̀bɛ́	‘paper’
		brìsà	brìsá	‘bush’
		hàmì	hàmí	‘concern’
b.	**TYPE 2**	tùrù	túrú	‘oil’
		bègì	bégí	‘white cotton cloth’
		kùnà	kúná	‘leprosy’

```
Type 1     / C V C V #,  -H /   →   [ C V C V # ]
                                              H
Type 2     / C V C V #,  -H /   →   [ C V C V # ]
                                          H   H
```

(5) High-toned roots

		indef.	before H (def.)	
a.	**TYPE 1**	mákò	mákǒ	‘need’
		jámú	jámǔ	‘clan name’
		bɛ́sɛ́	bɛ́sɛ̌	‘machete’
b.	**TYPE 2**	múrú	mùrú	‘knife’
		jégí	jègí	‘hope’
		télú	tèlú	‘tree’

```
Type 1     / C V C V #,  -H /   →   [ C V C V # ]
               H                          H    LH
           / C V C V #,  -H /   →   [ C V C V # ]
               H   H                      H    LH
Type 2     / C V C V #,  -H /   →   [ C V C V # ]
               H   H                          H
```

2.1 Sonority and the Type 1/Type 2 distinction: Braconnier (1982)

- Braconnier (1982: 27) observed that the distinction between Type 1 and Type 2 nouns is largely predictable by the final intervocalic consonant = ‘C_f’.

(6) C V C_f V #
t u r u

(7) Dioula consonant inventory (Braconnier and Diaby 1982: 5)

		labial	alveolar	palatal	velar		
obstruents	voiceless stops	p	t	c	k	kp	
	voiced stops	b	d	j	g	gb	
	voiceless fricatives	f	s	ʃ			h
	voiced fricatives	v	z				

sonorants	nasals	m	n	ɲ	ŋ
	liquids		l r		
	glides	w	y		(w)

- Braconnier's original observation:

When C_f =	fricatives, stops	→ Type 1	e.g., *sɛ̀bɛ́*
	nasals, liquids, [g~ɣ]	→ Type 1 or 2	e.g., *hàmí*, *túrú*
	Ø	→ Type 2	e.g., *fúá*

(Note: [g] ~ [ɣ] behaves phonotactically like a sonorant in Dioula: it occurs rarely word-initially and highly frequently intervocalically (Braconnier 1983: 36-38). It is treated here as a sonorant.)

2.2 SONORITY AND THE TYPE 1/TYPE 2 DISTINCTION: A QUANTITATIVE STUDY

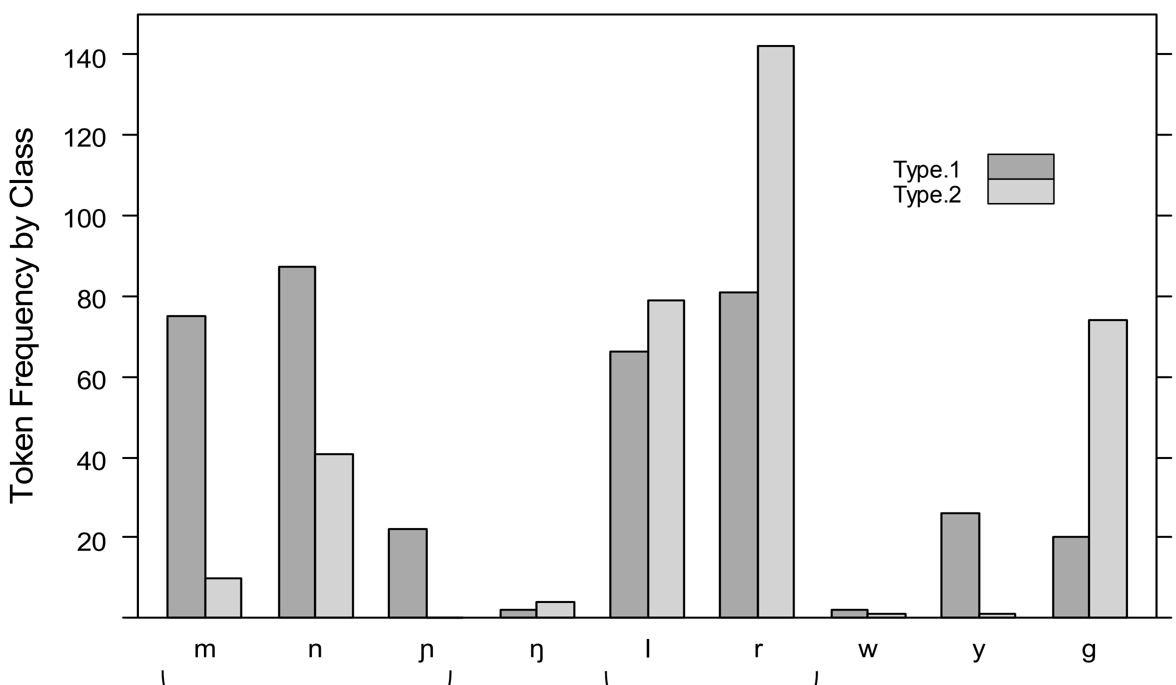
- This study: Corpus analysis of all nouns drawn from the Dioula dictionary (n = 1027).

(8) Distribution of C_f sonorants and obstruents by tone type class

C_f =	Type 1	Type 2
obstruent	290	4
sonorant	381	352
$\chi^2 = 1220.27$, df = 1, $p < 0.0001$		

- Though Braconnier (1982) makes no further distinctions between Type 1 and Type 2 nouns, quantitative examination reveals that there's a marked difference amongst the sonorant series in C_f position.

Figure 1. C_f sonorants by tone type class



more likely to be …opaque …transparent

- Significant difference amongst sonorants ($\chi^2 = 67.85$, df = 1, $p < 0.0001$):

When C_f =	nasals [m, n, ɲ]	→ Type 1 > Type 2	e.g., *hàmí* > *kúná*
	liquids [l, r]; [g]	→ Type 2 > Type 1	e.g., *túrú* > *lὲrí*
	(Too little data for [ŋ] or glides.)		

- The more sonorous the segment, the more likely it is to transmit tone onto the penultimate syllable; the less sonorous the segment, the more likely it is to block the transmission of tone.

(9)

vowels	↑	**Type 2**	*túrú*	↑	Most Sonorous
liquids					
nasals					
obstruents	↓	**Type 1**	*sὲbέ*	↓	Least Sonorous

❖ Consonant-tone and vowel-tone interactions → sonority-tone interaction.

3 THE AGREEMENT BY CORRESPONDENCE APPROACH

- The similarity basis underlying ABC makes it a natural framework for capturing the sonority-driven tone agreement in Dioula.
- MAX-ABC (following McCarthy 2010[1]): identifies pre-conditioning features for a corresponding relationship and features that undergo agreement if segments correspond.
- Correspondence constraints evaluate and penalize local pairs of segments because global evaluation results in pathological predictions (Hansson 2007; Rhodes 2010; cf. McCarthy 2010).

❖ In Dioula, segments that share sufficient similarity in sonority correspond and strive to be maximally similar in sharing tone specifications.

(10)

Type 2		*versus*	**Type 1**
V_i V_i	V_i r_i V_i		V_i k_j V_k
H H	H H H		H

- Sonority = the pre-conditioning feature for correspondence and agreement of tone (= target feature).
- Typologically for consonant harmony, Rose and Walker (2004: 484) suggest that sonority is an important feature in identifying segments for similarity and correspondence, along with voicing and place.
- Following analysis focuses primarily on L-toned Dioula nouns.

(11) Basic ABC constraint inventory

Correspondence:
a. MAX-XX: Segments must be in a corresponding relationship with other segments.

For target agreement feature [βF]:
b. IDENT-XX (tone): Corresponding segments must agree in tonal specification.
c. DEP-IO (H tone): Output high tone specifications must have input correspondents.

For pre-conditioning feature [αF]:
d. IDENT-XX {*x* sonority}: Corresponding segments must agree in *x* sonority.
e. IDENT-IO (sonority): Sonority identity must remain faithful to the input.

[1] McCarthy calls his revisions "ABC without CORR."

- Stringent IDENT-XX {*x* sonority} constraints target contiguous segments of the sonority hierarchy (de Lacy 2004):

(12) Least sonorous ⟵⟶ Most sonorous

obstruent	[sonorant, -continuant]	[sonorant, +continuant]	vowel
K	N	R	V

a. Ident-XX {V} vowels
b. Ident-XX {V, R} vowels, [sonorant, +continuant]
c. Ident-XX {V, R, N} sonorants
d. Ident-XX {V, R, N, K} all segments, including obstruents

- Ranking of specific sonority constraint (e.g., IDENT-XX {V, R}) forces segments within the more sonorous range of the sonority hierarchy to correspond and agree in tone but does not require the same of segments outside the targeted sonority range.

❖ RANKING FOR DIOULA TONE AGREEMENT

- Based on MAX-ABC (McCarthy 2010), correspondence and agreement is determined by the ranking of IDENT-XX [αF], IO FAITH [αF] » MAX-XX, IDENT-XX [βF] » IO FAITH [βF]:

(13) Ident-XX {V, R} Ident-IO (sonority) Ident-XX (tone)

Max-XX

DEP-IO (tone)

(14) IDENT-IO (sonority), IDENT-XX {V, R} » MAX-XX
prevents segments not sufficiently similar in sonority from corresponding and agreeing in tone.

Type 1, low-toned noun: no leftwards H tone agreement through less sonorant segments.

e.g., /hakɛ -H/ → [hàkɛ́] 'sin, def.'

/V k V, -H/ T T T	IDENT-IO (sonority)	IDENT-XX {V, R}	MAX-XX	IDENT-XX (tone)
☞ a. V_i k_j V_k T T H			2	
b. V_i k_i V_i H H H		W2	L	
c. V_i r_i V_i H H H	W1		L	

(15) MAX-XX, IDENT-XX (tone) » IO faithfulness (tone) (e.g., DEP-IO (H tone))
allows tone agreement for segments that are sufficiently similar in sonority, as specified by IDENT-XX {V, R}.

Type 2, low-toned noun: leftwards H tone agreement through more sonorant segments.

e.g., /turu -H/ → [túrú] 'oil, def.'

/V r V, -H/ T T T	…	IDENT-XX {V, R}	MAX-XX	IDENT-XX (tone)	DEP-IO (H tone)
☞ a. V_i r_i V_i H H H					2
b. V_i r_i V_i T T H				W1	L
c. V_i r_j V_k T T H			W2		L

- Ranking of IDENT-XX {*x* sonority} constraints determine segments that pre-condition correspondence.
- ❖ In Dioula, sonority determines surface tone pattern.

(16) IDENT-XX {V, R, N, K} » MAX-XX » IDENT-XX {V, R}), instead of IDENT-XX {V, R} » MAX-XX, wrongly allows Type 2 tone agreement through an obstruent.

/V k V, -H/ T T T	…	IDENT-XX {V, R, N, K}	MAX-XX	IDENT-XX (tone)	IDENT-XX {V, R}
(☞) a. V_i k_j V_k T T H			W2		L
💣 b. V_i k_i V_i H H H					2

- Gradience amongst the sonorant C_f segments can be obtained from the partial ranking of IDENT-XX {*x* sonority} constraints in relation to IDENT-XX (T) (Anttila 1997; 2002; 2007; a.o.).

e.g., IDENT-XX {V, R, N} » MAX-XX » IDENT-XX {V, R}: nasals are Type 2 and agree in tone.
IDENT-XX {V, R} » MAX-XX: nasals are Type 1 and do not agree in tone.

- Given stringent hierarchy constraints, the prediction is that sounds on the low end of the sonority hierarchy—obstruents—will transmit tone only when sonorants in the same system do.

(17) Factorial typology (generated using OTSoft (Hayes et al. 2003)

Input C_f =	**Output 1**	**Output 2**	**Output 3**	**Output 4**
obstruent	tone spread	no spread	no spread	no spread
[nasal]	tone spread	tone spread	no spread	no spread
[liquid]	tone spread	tone spread	tone spread	no spread

- (Full constraint set and example tableaux in Appendix A.)
- H-toned roots necessitate additional constraints (for contour tones, etc.), but work under the same principle of tonal agreement driven by sonority similarity.

4 CONSONANT-TONE INTERACTION BEYOND DIOULA

- Dioula pattern = disruption of continued/long-distance transmission of F0
  Depressor/elevator phenomena = local disruption and perturbation in F0

- Depressor consonants = voiced obstruents; aspirated, fricated, breathy voiceless obstruents
- Elevator (anti-depressor) consonants = voiceless (plain) obstruents
- Common depressor/elevator phenomena: L tone insertion, L tone spread, blocking of L tone docking, downstep insertion, blocking of H tone docking, blocking of H tone shift, voicing insertion. (Bradshaw 1999; Tang 2008; Lee 2008; a.o.)

(18) Ikalanga: depressors block H tone agreement (Hyman and Mathangwane 1998; Mathangwane 1999)

a.	né-**tʃ**i-lopa	né**tʃ**ílópa		‘and a liver’
b.	né-**b**áni	né**b**ani	*né**b**áni	‘and a forest’

4.1 SEGMENTAL OPACITY TO TONE IN ABC

❖ Depressor and elevator (anti-depressor) consonant effects can be generated in ABC through correspondence opacity, when a markedness constraint outranks IDENT-XX (tone) (following ABC blocking effects in Hansson 2007; Walker 2009; Rhodes 2010; cf. Rose and Walker 2004).

(19) Markedness constraints on laryngeal features and tone (Yip 2002; Lee 2008; for a functional basis, see Tang 2008)
a. *H/[+voice]: No H tone in [+voice] segments.
b. *L/[-voice]: No L tone in [-voice] segments.

(20) Regular pattern: no tone blocking by non-depressors; H tone agreement on all segments.

e.g., /né-tʃi-lopa/ → [nétʃílópa] ‘and a liver’

/V tʃ V/ H T H	…	*H/ [+voice]	IDENT-XX {V, R, N, K}	MAX-XX	IDENT-XX (tone)	IDENT-IO (tone)
☞ a. V_i $tʃ_i$ V_i H H H						1
b. V_i $tʃ_i$ V_i H T T					W1	1
c. V_i $tʃ_j$ V_j H H H				W1		1

(21) Depressor effect: [+voice] segment is opaque and blocks H tone agreement.

e.g., /né-báni/ → [nébani], *nébáni ‘and a forest’

/V b V/ H T H	…	*H/ [+voice]	IDENT-XX {V, R, N, K}	MAX-XX	IDENT-XX (tone)	IDENT-IO (tone)
☞ a. V_i b_i V_i H T T					1	1
b. V_i b_i V_i H H H		W1			L	1

- High-ranking markedness (*H/[+voice]) forces opacity of the voiced obstruent in a correspondence relationship, lowering the tone of the following vowel.

4.2 TONES AFFECTING CONSONANT QUALITY

e.g., Wuyi (Wu): H tone spread causes devoicing. /sa24-vuo31/ → [sa24 **f**uo53] ‘raw meal’ (Yip 2002: 34)
e.g., Jabem (Melanesian): L tone spread causes voicing. /ká- wìŋ/ → [gàwìŋ] ‘accompany, 1sg. realis’ (Yip 2002: 34)
(for more examples, see Lee 2008: 56–58)

- ABC system for consonant-tone interaction predicts that tones can affect consonant identity, from the possible lower ranking of IDENT-IO (sonority).

(22) Low ranking of IDENT-IO (sonority) produces voicing rather tone agreement in order to satisfy the high-ranked *H/[+voice] markedness constraint.

/V g V/ H T H	…	*H/ [+voice]	IDENT-XX {V, R, N, K}	MAX-XX	IDENT-XX (tone)	IDENT-IO (sonority)
☞ a. V_i k_i V_i H H H						1
b. V_i g_i V_i H T T					W1	L
c. V_i g_i V_i H H H		W1				L

5 CONCLUSION

❖ Does ABC supplement or supplant autosegmental feature-spreading?

- Primary difference between ABC and feature-spreading:
  ABC: dependence on similarity of participant segments
  feature-spreading: not regularly determined by relative similarity

❖ Evidence from tone: a sonority basis for segment-tone interaction

- In Dioula,
  - Onset consonants, external to the mora or a traditional tone-bearing unit, can affect tone agreement.
  - Sonority of these onset consonants determines the ability of tone agreement.

- In autosegmental feature-spreading, tones are treated as independent entities from the segments with which they are associated, but Dioula provides evidence that there is a closer link between tones and segments:
  → i.e., the ability of a more sonorant segment to carry and transmit pitch information.

- Under this more phonetically-grounded view of tone processes, it seems more natural for there to be specific functionally-motivated markedness constraints that target [±voice] segments in depressor/elevator effects.
- Sonority-based view predicts that the likelihood of tone transmission correlates with sonority similarity between segments: within a single system, less sonorous segments will not transmit tone unless more sonorous segments do. (see also segmental similarity in nasal agreement; Walker 1998)

e.g., Contour tone licensing follows an implication hierarchy. (Gordon 2001; Zhang 2001)

CVV › CVR › CVC › CV

e.g., Dioula Type 1/Type 2 noun distinctions follow sonority hierarchy:

vowels	↑	**Type 2**	*túrú*	↑	Most Sonorous
liquids					
nasals					
obstruents	↓	**Type 1**	*sɛ̀bɛ́*	↓	Least Sonorous

❖ ABC's similarity-based approach offers an advantage in describing certain vowel-tone and consonant-tone interactions that depend on sonority.
– It's possible to model the Dioula pattern with a modified theory of autosegmental feature-spreading.
– But ABC can already do this, and it limits the typological space of tone behavior (preliminarily: in the correct ways) by building in the similarity prerequisite for agreement and harmony.

❖ Remaining issues:
– Directionality
– Boundedness

❖ With ABC's ability to deal with vowel and consonant harmony, tone is crucial to testing the limitations and differences between ABC and feature-spreading:
→ Can ABC account for the entire range of tonal phenomena (e.g., contour tones, floating features) that autosegmental theory does?

Thank you!

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Selected References

Anttila, Arto. 1997. Deriving variation from grammar. In Frans Hinskens, Roeland van Hout, and Leo Wetzels (ed). Variation, Change, and Phonological Theory. Amsterdam: John Benjamins. 35–68.
Anttila, Arto. 2002. Morphologically conditioned phonological alternations. Natural Language & Linguistic Theory. 20: 1–42.
Anttila, Arto. 2007. Variation and optionality. In de Lacy, Paul (ed). The Cambridge Handbook of Phonology. UK: Cambridge University Press. 161–194.
Blevins, Juliette. 1995. The syllable in phonological theory. In Goldsmith, John A. (ed). The Handbook of Phonological Theory. Cambridge, Massachusetts: Blackwell Publishers. 206–244.
Braconnier, Cassian. 1982. Le système tonal du dioula d'Odienné, tome 1. Abidjan, Ivory Coast: Université d'Abidjan.
Braconnier, Cassian and S. Diaby. 1982. Dioula d'Odienné: Material Lexical. Institut de Linguistique Appliquee, No 96. Agence de cooperation culturelle et technique.
Braconnier, Cassian. 1983. Phonologie du dioula d'Odienné. Agence de cooperation culturelle et technique.
Bradshaw, Mary. 1999. A Crosslinguistic Study of Consonant-Tone Interaction. PhD dissertation. Ohio State University.
Clements, G. N. 1990. The role of the sonority cycle in core syllabification. In Beckman, Mary E. and John Kingston (ed). Papers in Laboratory Phonology I: Between the Grammar and Physics of Speech. Cambridge, UK: Cambridge University Press. 283–333.
Crowhurst, Megan and Lev Michael. 2005. Iterative footing and prominence-driven stress in Nanti (Kampa). Language. 81(1): 47-95.
De Lacy, Paul. 2004. Markedness Conflation in Optimality Theory. Phonology. 21(2): 145–199.
De Lacy, Paul. 2007. The interaction of tone, sonority, and prosodic structure. In de Lacy, Paul (ed). The Cambridge Handbook of Phonology. UK: Cambridge University Press. 281–307.
Downing, Laura. 2001. Voiceless Tone Depressors in Nambya and Botswana Kalang'a. Proceedings of the 27th Annual Meeting of the Berkeley Linguistic Society.
Gallagher, Gillian. 2008. Total identity in co-occurrence restrictions. Proceedings of the 34th Annual Meeting of the Berkeley Linguistic Society.
Gallagher, Gillian and Jessica Coon. 2009. Distinguishing total and partial identity: Evidence from Chol. Natural Language and Linguistic Theory. 27: 545–582.
Gordon, Matthew. 2001. A typology of contour tone restrictions. Studies in Language. 25: 405–444.
Hansson, Gunnar. 2001. Theoretical and Typological Issues in Consonant Harmony. PhD dissertation. University of California, Berkeley.
Hansson, Gunnar. 2007. Blocking Effects in Agreement by Correspondence. Linguistic Inquiry. 38(2): 395–409.
Hayes, Bruce; Bruce Tesar; and Kie Zuraw. 2003. OTSoft 2.1. software package. <http://www.linguistics.ucla.edu/people/ hayes/otsoft/>
Hyman, Larry. 1985. Review: Le système tonal du dioula d'Odienné. Language 61(2): 474–476.
Hyman, Larry. 2007. Tone: Is it Different? UC Berkeley Phonology Lab Annual Report.
Hyman, Larry and Joyce T. M. Mathangwane. 1998. Tonal domains and depressor consonants in Ikalanga. The theoretical aspects of Bantu tone. 195–230.
Hyslop, Gwendolyn. 2009. Kurtöp Tone: A tonogenetic case study. Lingua 119: 827–845.
Jespersen, Otto. 1904. Fonetik. Copenhagen: Det Schubotheske Forlag.
Lee, Seunghun Julio. 2008. Consonant-Tone Interaction in Optimality Theory. PhD dissertation. Rutgers, the State University of New Jersey.
Mathangwane, Joyce Thambole Mogatse. 1999. Phonetics and Phonology of Ikalanga: a diachronic and synchronic study. PhD dissertation. University of California, Berkeley.
McCarthy, John J. 2010. "Agreement by Correspondence Without Corr Constraints." The Selected Works of John J. McCarthy. <http://works.bepress.com/john_j_mccarthy/106>
Miller, Brett. 2012. Sonority and the larynx. In Parker, Steve (ed). The Sonority Controversy. Berlin, Germany: De Gruyter Mouton. 266–288.
Parker, Stephen G. 2002. Quantifying the Sonority Hierarchy. PhD dissertation. University of Massachusetts, Amherst.
Rhodes, Russell. 2010/submitted. Vowel Harmony as Agreement by Correspondence. Ms. University of California, Berkeley.
Rose, Sharon and Rachel Walker. 2004. A Typology of Consonant Agreement as Correspondence. Language. 80(3): 475–531.
R Development Core Team. 2010. R: A language and environment for statistical computing. R Foundation for Statistical Computing. Vienna, Austria. <http://www.R-project.org>
Sasa, Tomomasa. 2009. Treatment of vowel harmony in Optimality Theory. PhD dissertation. University of Iowa.
Sylak-Glassman, John. 2012. Audibility and Syllabic Nuclei. Ms. University of California, Berkeley.
Tang, Katrina. 2008. The Phonology and Phonetics of Consonant-Tone Interaction. PhD dissertation. University of California, Los Angeles.
Walker, Rachel. 1998. Nasalization, neutral segments, and opacity effects. PhD dissertation. University of California, Los Angeles.
Walker, Rachel. 2009. Similarity-sensitive blocking and transparency in Menominee. Paper presented at 83rd Annual Meeting of the LSA. San Francisco, California. 9 Jan 2009. <http://www-bcf.usc.edu/~rwalker/MenomineeLSAHdt.pdf>
Zec, Draga. 2007. The syllable. In de Lacy, Paul (ed). The Cambridge Handbook of Phonology. UK: Cambridge University Press. 161–194.
Zhang, Jie. 2001. The Effects of Duration and Sonority on Contour Tone Distribution—Typological Survey and Formal Analysis. PhD dissertation. University of California, Los Angeles.
Yip, Moira. 1995. Tone in East Asian Languages. In Goldsmith, John A. (ed). The Handbook of Phonological Theory. Cambridge, Massachusetts: Blackwell Publishers. 476–494.
Yip, Moira. 2002. Tone. Cambridge, UK: Cambridge University Press.